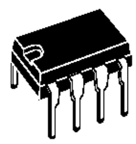
SGS-THOMSON MICROELECTRONICS

TDA4605

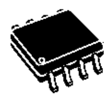
CONTROL CIRCUIT FOR SWITCH MODE POWER SUPPLIES USING MOS TRANSISTORS

- FOLD-BACK CHARACTERISTIC PROVIDES OVERLOAD PROTECTION FOR EXTERNAL DIODES
- BURST OPERATION UNDER SHORT-CIRCUIT AND NO LOAD CONDITIONS
- LOOP ERROR PROTECTION
- SWITCH-OFF IN CASE OF TOO LOW LINE VOLTAGE (under voltage switch-off)
- LINE VOLTAGE COMPENSATION OF OVERLOAD POINT
- SOFT-START FOR SMOOTH START-UP
- CHIP OVER-TEMPERATURE PROTECTION (thermal shutdown)
- ON-CHIP PARASITIC TRANSFORMER OSCILLATION SUPPRESSION CIRCUITRY
- DECREASE OF REGULATED VOLTAGE FOR LOW POWER CONSUMPTION



DIP8
(Plastic Package)

ORDER CODE : TDA4605



SO8
(Plastic Micropackage)

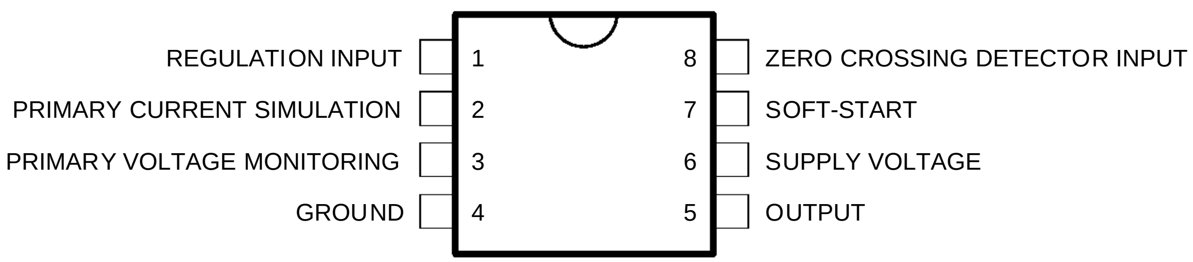
ORDER CODE : TDA4605D

DESCRIPTION

The IC TDA4605 controls the MOS Power Transistor and performs all necessary regulation and monitoring functions in free running flyback converters. Since good load regulation over a wide load range is attained, this IC is particularly suitable for Consumer as well as Industrial Power Supplies.

Alternative source of the TDA4605 is also available from SIEMENS Semiconductors Consumer Electronics A.G.

PIN CONNECTIONS



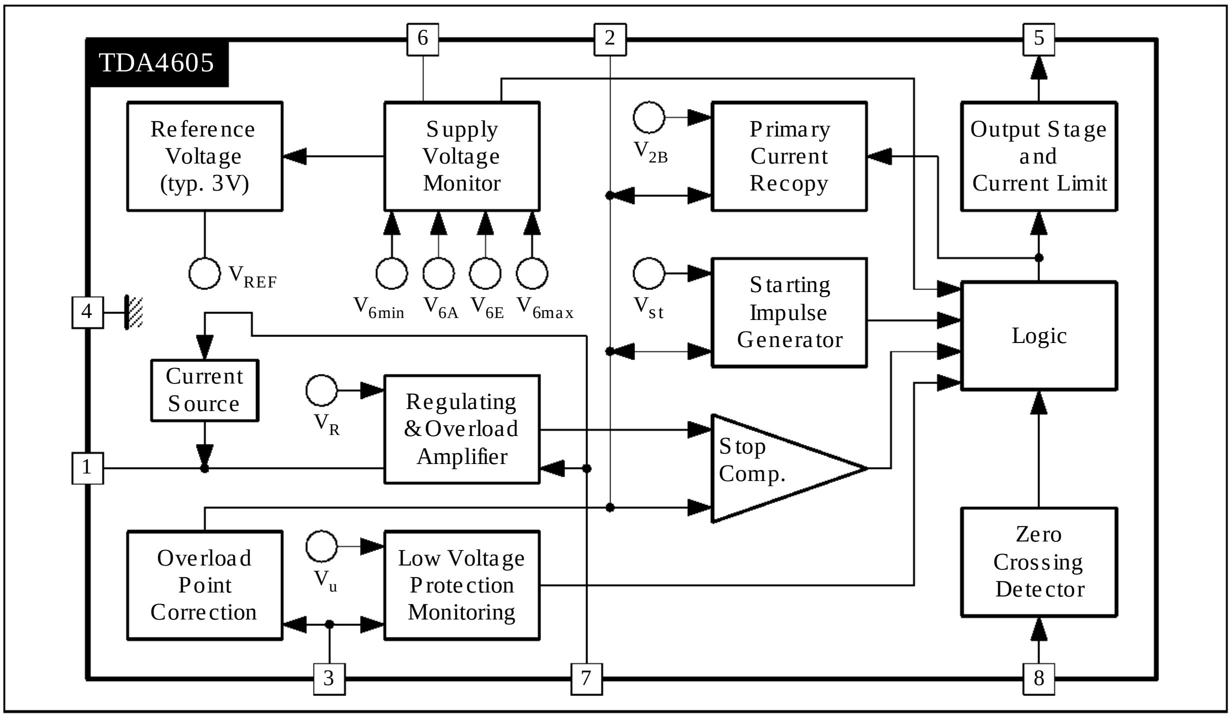
4605-01.EPS

PIN CONFIGURATION

Pin Number	Description
1	Regulating voltage : information input concerning secondary voltage. By comparing the regulating voltage obtained from the regulating winding of the transformer with the internal reference voltage, the output pulse width on Pin 5 is adapted to the load of the secondary side (normal, overload, short circuit, no load)
2	Primary current simulation : information input regarding the primary current. The primary current rise in the primary winding is simulated at Pin 2 as a voltage rise by means of external RC element. When a value is reached that is derived from the regulating voltage at Pin 1, the output pulse at Pin 5 is terminated. The RC element serves to set the maximum power at the overload point.
3	Primary voltage detector : input for primary voltage monitoring. When the line voltage is too low the IC is switched-off by comparing V_3 with an internal reference. Voltage at Pin 3 is used for overload point compensation.
4	Ground
5	Output : push-pull output for charge and discharge of the gate capacitance of the power MOS transistor.
6	Supply voltage : Supply voltage input. From it are derived a stable internal reference voltage (V_{REF}) and the switching threshold V_{6A}, V_{6E}, $V_{6\ max}$ and $V_{6\ min}$ for the supply voltage detector. if $V_6 > V_{6E}$ the V_{REF} is switched on and switched off when $V_6 < V_{6A}$. In addition the logic is only enable for $V_{6\ min} < V_6 < V_{6\ max}$.
7	Soft-start : input for soft-start and integration network. Start-up will begin with short pulses by connecting a capacitor between Pin 7 to ground. This capacitor together with a resistor connected between Pin 7 and error amplifier output also as acts an integrator network for regulation.
8	Zero detector : Input for the oscillator feedback. After starting oscillator, every zero transit of the feedback voltage (falling edge) triggers an output pulse at Pin 5. The trigger threshold is at typically - 50mV

4605-01.TBL

BLOCK DIAGRAM



4605-02.EPS

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter		Pin	Value	Unit
V_1	Supply Voltage		1	-0.3, +3	V
V_2			2	-0.3	V
V_3			3	-0.3	V
V_4			4	-0.3	V
V_6			6	-0.3, +20	V
V_7			7	-0.3	V
I_1	Supply Current		1	3	mA
I_2			2	3	mA
I_3			3	3	mA
I_4		$t_p \leq 50\mu s$, $V \leq 0.1$	4	- 1.5	A
I_5		$t_p \leq 50\mu s$, $V \leq 0.1$	5	-0.5, +1.5	A
I_6		$t_p \leq 50\mu s$, $V \leq 0.1$	6	0.5	A
I_7			7	3	mA
I_8			8	-3, +3	mA
T_j	Junction Temperature (autom. thermal disjunction)			+125	^oC
T_{stg}	Storage Temperature			-40, +125	^oC

4605-02.TBL

THERMAL DATA

Symbol	Parameter	Value	Unit
$R_{th(j-a)}$	Junction-ambient Thermal Resistance	80	$^oC/W$
$R_{th(j-c)}$	Junction-case Thermal Resistance	45	$^oC/W$
T_{amb}	Ambient Temperature	-20, +85	^oC

4605-03.TBL

ELECTRICAL CHARACTERISTICS (V_{CC} = 10V, T_{amb} = 25^{o}C, unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
START-UP HYSTERESIS						
I_{6E0}	Start-up Current Drain	$V_6 = V_{6E}$		0.6	0.8	mA
V_{6E}	Switch-on Voltage		11	12	13	V
V_{6A}	Switch-off Voltage		4.5	5	5.5	V
I_{6E1}	Switch-on Current	$V_6 = V_{6E}$		11		mA
I_{6A1}	Switch-off Current	$V_6 = V_{6A}$		10		mA
VOLTAGE CLAMP (V_6 = 10V, IC Switched off)						
$V_{2(Max.)}$	At Pin 2 ($V_6 < V_{6E}$)	I_2 = 1mA	5.6	6.6	9	V
$V_{3(Max.)}$	At Pin 3 ($V_6 < V_{6E}$)	I_3 = 1mA	5.6	6.6	9	V
CONTROL RANGE						
V_{1R}	Control Input Voltage		400	410	420	mV
$-V_R$	Voltage Gain of the Control Circuit in the Control Range	$V_R = d(V_{2S} - V_{2B})/dV_1$ f = 1kHz		43		dB
PRIMARY CURRENT SIMULATION VOLTAGE						
V_{2B}	Basic Value		0.955	1.00	1.03	V
OVERLOAD RANGE AND SHORT CIRCUIT OPERATION						
V_{2O}	Peak Value in the Range of Secondary Overload	$V_1 = V_{1R}$ - 10mV	2.8	2.95	3.1	V
DV_2	Maximum Ramp Amplitude	$V_{2O} - V_{2B}$	1.82	1.95	2.08	V
V_{2S}	Peak Value in the Range of Secondary Short Circuit Operation	$V_1 = 0$	2.3	2.5	2.7	V
FOLDBACK POINT CORRECTION						
$-I_2$	Foldback Point Correction Current	V_3 = 3.7V	300	500	650	µA

4605-04.TBL

ELECTRICAL CHARACTERISTICS (V_{CC} = 10V, T_{amb} = 25°C, unless otherwise specified) (continued)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
GENERALLY VALID DATA (V_6 = 10V) VOLTAGE OF THE ZERO Transition DETECTOR						
V_{8P}	Positive Clamping Voltage	I_8 = 1mA		0.75		V
V_{8N}	Negative Clamping Voltage	I_8 = -1mA		-0.2		V
V_{8S}	Threshold Value		40	50		mV
TUL	Suppression of Transformer Ringing		3	3.8	4.5	µs
$-I_8$	Input Current	V_8 = 0	0		4	µV
PUSH-PULL OUTPUT STAGE SATURATION VOLTAGES						
V_{SatU}	Pin 5 Sourcing	I_5 = -0.1A		1.5	2.0	V
V_{SatU}	Pin 5 Sinking	I_5 = +0.1A		1.0	1.2	V
V_{SatU}	Pin 5 Sinking	I_5 = +0.5A		1.4	1.8	V
OUTPUT SLOW RATE						
$+dV_5/dt$	Rising Edge			70		V/µs
$-dV_5/dt$	Falling Edge			100		V/µs
REDUCTION OF CONTROL VOLTAGE						
$-I_1$	Current to reduce the Control Voltage	V_7 = 1V		50		µA
PROTECTION CIRCUIT						
$V_{6(Min.)}$	Undervoltage Protection for V_6 : Voltage at Pin 5 = $V_{5(Min.)}$ if $V_6 < V_{6(Min.)}$		7.0	7.25	7.5	V
$V_{6(Max.)}$	Overvoltage Protection for V_6 : Voltage at Pin 5 = $V_{5(Min.)}$ if $V_6 > V_{6(Max.)}$		15	16	16.5	V
V_{3A}	Undervoltage Protection for V_{AC} : Voltage at Pin 5 = $V_{5(Min.)}$ if $V_3 < V_{3A}$	V_2 = 0V	970	1005	1040	mV
Oj	Over Temperature : at the given chip temperature the IC will switch V_5 to $V_{5(Min.)}$			150		°C
V_{3Sat}	Voltage at Pin 3 if one of the protection functions was triggered ; (V_3 will be clamped until $V_6 < V_{6A}$)	I_3 = 750µA		0.4	0.8	V
I_6	Current Drain during Burst Operation	$V_3 = V_2$ = 0V		8		mA

4605-05.TBL

FUNCTIONAL DESCRIPTION

In free running fly-back converters, the TDA4605 assumes control of a MOS power transistor and all necessary regulation and monitoring functions.

The serial circuit of power transistor and primary winding of the flyback transformer is connected to the input voltage. During the switch-on period of the transistor, energy is stored in the transformer and during the switch-off period it is fed to te load via the secondary winding. By varing the switch-on time of the power transistor, the IC controls each portion of energy transferred to the secondary side such that the output voltage remains nearly independent of load variations.

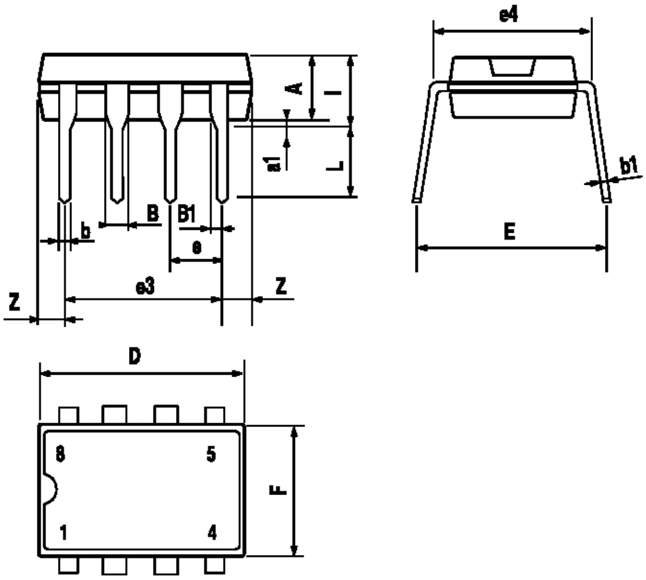
The required control information is taken from the input voltage during the switch-on period and from a regulation winding during the switch-off period. A new cycle begins as soon as the energy stored in the transformer has been totally delivered to the secondary side.

In different load ranges, the SMPS will behave as follows :

- **No-Load Operation :** The power supply unit oscillates in non continuous mode at a typical frequency of 20 to 40kHz. Depending upon the transformer winding and the regulated voltage divider, the output voltage can be slightly above the nominal value.
- **Normal Operation :** Starting from typ. 200kHz, the switching frequency falls with increasing load and decreasing AC voltage. The duty cycle depends primarily on the AC voltage. The output voltage is only slightly load-dependent.
- **Overload Point :** Maximum output power is available at this point of the output characteristics
- **Overload :** The energy transferred per operation cycle is limited at the top. Therefore, the output voltage will fall with secondary oveloading.

PACKAGE MECHANICAL DATA

8 PINS - PLASTIC DIP



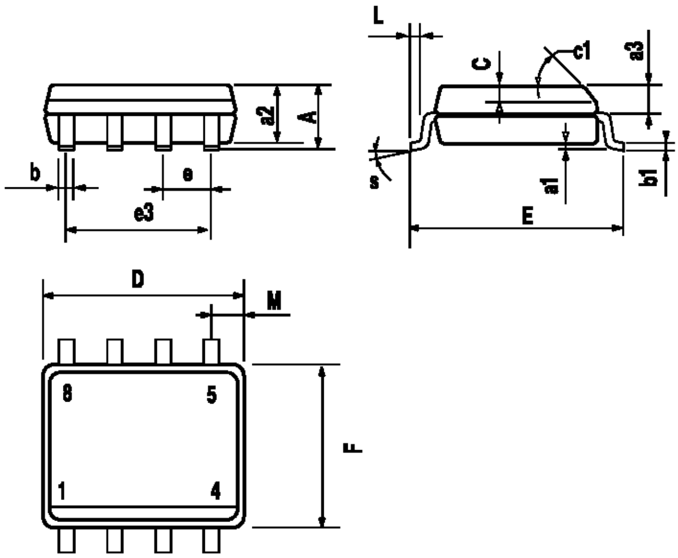
PM-DIP8.EPS

Dimensions	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A		3.32			0.131	
a1	0.51			0.020		
B	1.15		1.65	0.045		0.065
b	0.356		0.55	0.014		0.022
b1	0.204		0.304	0.008		0.012
D			10.92			0.430
E	7.95		9.75	0.313		0.384
e		2.54			0.100	
e3		7.62			0.300	
e4		7.62			0.300	
F			6.6			0260
I			5.08			0.200
L	3.18		3.81	0.125		0.150
Z			1.52			0.060

DIP8.TBL

PACKAGE MECHANICAL DATA

8 PINS - PLASTIC MICROPACKAGE (SO)



PM-SO8.EPS

Dimensions	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			1.75			0.069
a1	0.1		0.25	0.004		0.010
a2			1.65			0.065
a3	0.65		0.85	0.026		0.033
b	0.35		0.48	0.014		0.019
b1	0.19		0.25	0.007		0.010
C	0.25		0.5	0.010		0.020
c1	45^o (Typ.)					
D	4.8		5.0	0.189		0.197
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		3.81			0.150	
F	3.8		4.0	0.15		0.157
L	0.4		1.27	0.016		0.050
M			0.6			0.024
S	8^o (Max.)					

SO8.TBL